FOR

ULTRA STABLE SIGNAL SOURCE SYSTEM

MODEL KC-1, KLYSTRON COOLING CONTROL
MODEL MO-4, KLYSTRON POWER SUPPLY
MODEL MS-30, RF SOURCE (7.5 - 10.0 GC)
MODEL MS-31, RF SOURCE (8.2 - 12.4 GC)

WEINSCHEL ENGINEERING

GAITHERSBURG, MARYLAND

PRELIMINARY INSTRUCTION MANUAL

FOR

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Attachments:
1. Schematic Diagram B129-23
2. Specifications (Bulletin 486-9/62)

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1962 Weinschel Engineering
Kensington, Maryland

ULTRA STABLE SIGNAL SOURCE SYSTEM

1. ASSEMBLY OF MODEL KC-1

The Model KC-1 consists of a 6-foot, closed, relay rack, upper control unit, lower control unit, and a motor and pump assembly. The motor and pump assembly is mounted in the bottom of the 6-foot relay rack. The lower control unit is also mounted in the bottom of the relay rack while the upper unit is mounted in the top. The large diameter water return hose is connected between the pump and hose filling of the upper reservoir.

Before filling the system with water, all hose connections should be checked to be sure they are tight. The two water outlets on the upper unit, as well as the two inlets on the lower unit, should also be turned off.

The system will hold approximately four gallons of water. The water should be poured into the upper unit. Two pieces of the clear tygon tubing supplied with the system should be connected between the water outlets on the upper unit and the lower unit. Connect the power cord from the rear of the lower unit to a 115v ac line and turn on the main switch on the front panel of the lower control unit. Next turn on all four water faucets. The water from the upper unit should flow down into the lower unit. When the water level in the lower unit becomes high enough that the float in the lower unit actuates a microswitch, the pump will start and pump the water back to the upper unit. After the water system has run for a while and no leaks have been detected, the switch may be turned off and the four faucets closed.

2. MODEL MO-4 CONNECTIONS

If two Model MO-4 supplies are being used, they may either be mounted in the relay rack between the upper and lower units of the Model KC-1 or operated on the bench. In either case, the Model MO-4 is supplied with a special power cord with a Hubble twist lock connector on one end. Using these power cords, one MO-4 should be plugged into the left rear of the lower control unit and the other MO-4 plugged into the right rear of the lower control unit.

3. MODEL MS-30 OR MS-31 CONNECTIONS

The two MS-30 or MS-31 rf sources should be set on a bench close to the KC-1 and two MO-4 supplies. The two lower faucets may be opened and the tygon tubing removed from the upper faucets. This will allow the water in the tubing to partially drain into the lower reservoir. After the water has drained, the two lower faucets should again be closed. Connect the open end of one piece of the tygon tubing to

either input of one of the rf sources. Connect the other piece of tygon tubing to either input of the other rf source. Take the two additional pieces of tygon tubing and connect one piece between the remaining open input of each source and the respective water outlet on the upper unit. The path of water flow for each unit should be as follows: The water from the upper left-hand faucet should flow into one input on one of the rf sources and out of the other outlet down to the lower left-hand faucet. The water from the upper right-hand faucet should flow into the other source and out of it and into the lower right-hand faucet.

The small two pin plug on the rf source that is connected to the left-hand faucets should be connected to the two pin receptacle on the left-hand side of the lower control panel. The large eight pin connector from the same source should be connected to the receptacle on the front panel of the MO-4 that is also plugged into the left rear of the lower control unit.

The source and MO-4 on the right-hand side should be connected in the same manner. After these connections have been made, both the right-hand MO-4, rf source, and water supply and the left-hand MO-4, rf source, and water supply may be operated simultaneously or individually since all controls, including water flow, are completely independent of each other.

The system is now interlocked so that in the event either klystron should overheat, the corresponding MO-4 will be automatically shut off.

4. AUTOMATIC FREQUENCY FOLLOWER

If the system is going to be used with the Model VM-1, the automatic frequency follower cable should be connected between the A.F.F. connector on the right side panel of the VM-1 control unit and the A.F.F. connector on the rear of the chassis on the Model MO-4, which is to be used to power the local oscillator.

5. SYSTEM OPERATING PROCEDURE

(1) Turn on all four water faucets on the Model KC-1.

(2) Be sure all MO-4 switches are in the OFF position.

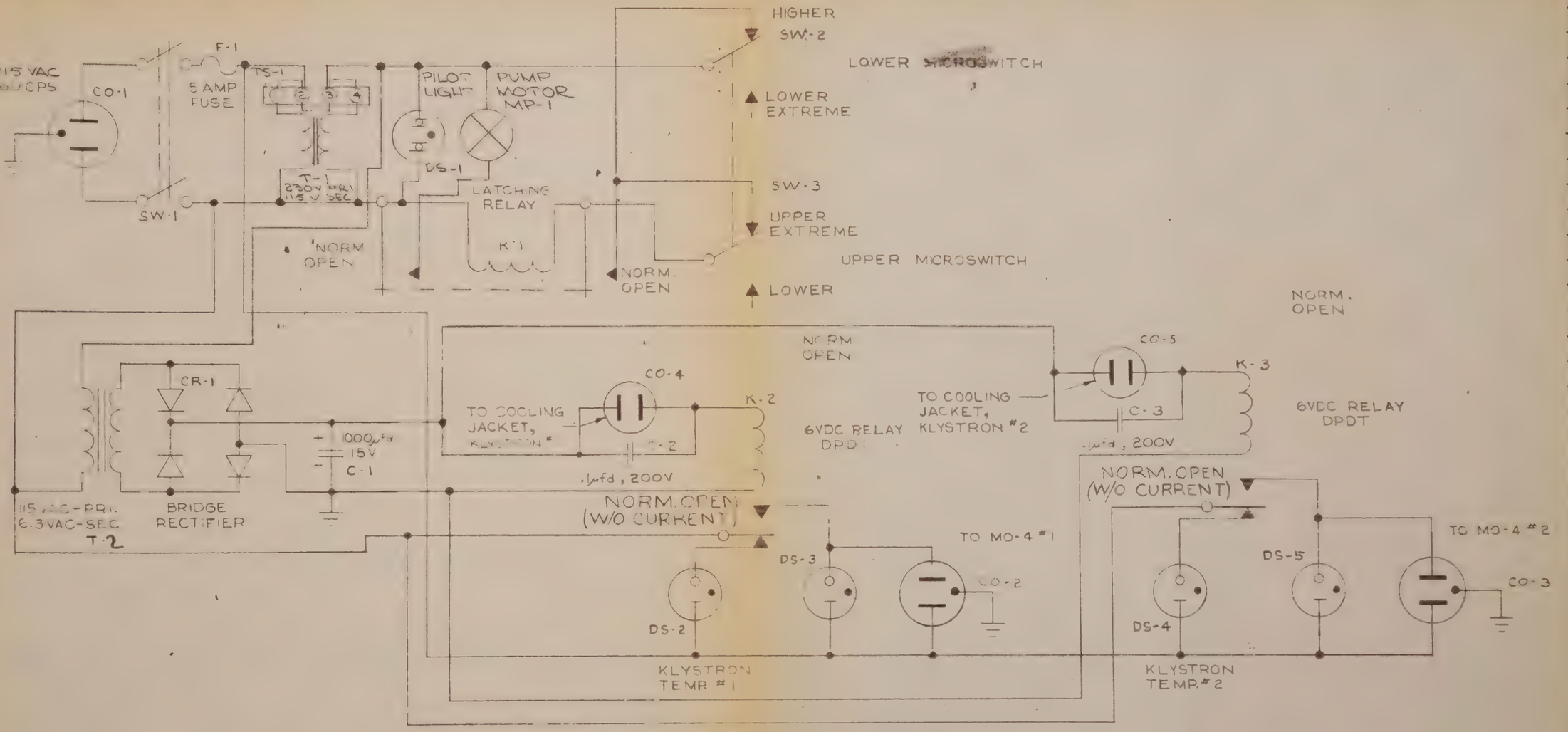
(3) Turn on the Model KC-1. The two red lights on the Model KC-1 lower control panel should light, giving an indication of normal operation.

(4) Refer to the Model MO-4 Instruction Manual for operating procedure to be used with regard to that instrument.

(5) For either the MS-30 or MS-31, the beam voltage should be adjusted on the MO-4 to approximately 450 volts. The repeller voltage should be adjusted on the MO-4 to between 400 and 500 volts. If there is any doubt as to which is the most suitable mode for the klystron to operate in, consult the test data supplied with each source. The test data gives the beam and repeller voltages for the test frequencies used at the factory and are for optimum operation.

(6) The internal cavity of either klystron may be adjusted by turning the black frequency adjust knob on top of the rf source being used. To set the klystron for a specific frequency, this knob should be set to any initial point and the repeller voltage peaked for a maximum output of the rf source. The frequency meter on the side arm of the directional coupler should be slowly rotated until a dip in output is indicated on the left-hand MO-4 meter (see MO-4 Manual). The frequency is then read directly from the frequency meter. If the frequency is too high, the frequency adjust knob should be rotated counter-clockwise. If the frequency is too low, it should be rotated clockwise. The repeller voltage is again peaked and a new frequency reading is taken using the frequency meter. This procedure is repeated until the desired frequency is obtained.

(7) When used with the VM-1, the rf source which is to be used as a signal source is set to the calibration frequency and the other source (local oscillator) is adjusted to approximately 30 mc above or below the signal source frequency. The frequency modulation output of the VM-1 is now observed on an oscilloscope and the medium repeller voltage adjustment on the MO-4 (local oscillator) is slowly adjusted until the oscilloscope pattern shows the proper frequency null. The automatic frequency follower is then turned on and the signal should lock in (see VM-1 Instruction Manual).



B129-23

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REVISIONS		
A	FCN-KC-1-2 2/21/62 A.R.	
B	ECN-KC-1-8 SJM 8-7-63	
C	FCN KC-1-9 DR 1-28/64	
D	ECN KC-1-10	

USED ON	ASSY. DRWG.
KC-1	

DIMENSIONS ARE IN INCHES
TOLERANCES
All Three Decimal Dims ± .01
All 2 Place Decimal Dims ± .1
All Fractional Dims ± 1/64
All Angles ± 2°
Unless Otherwise Specified

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Weinschel Engineering
Kensington, Maryland

SCHEM. DIA., KLYSTRON COOLER CONTROL

MATERIAL

FINISH

DFDL 11-8-61	C	SCALE
E	A	B129-23

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ULTRA STABLE SIGNAL SOURCE SYSTEM 7.5 - 18 GC

This Weinschel Ultra Stable Signal Source is a complete rf system consisting of the following two units:

Model MO-4 Klystron Power Supply;
Model KC-1 Klystron Cooling Unit;

and any of the following sources:

Model MS-30 RF Source (7.5 - 10.0 GC);
Model MS-31 RF Source (8.2 - 12.4 GC);
Model MS-32 RF Source (12.0 - 18.0 GC).

FEATURES:

Stability:

Constant voltages provided by the highly regulated Model MO-4 Power Supply and uniform cooling by the Model KC-1 water cooling unit help stabilize the klystron output power and frequency.

Low Incidental FM:

Both with cw and 100% square wave modulation the FM is held to less than 20 KC. This is accomplished by:

Special Circuits in the MO-4
Low hum and noise on klystron voltages
Low microphonics and the stable temperature of the KC-1

Easily Positioned Signal Sources:

The signal sources, Models MS-30, MS-31 and MS-32 are small (approximately 7" cube), light-weight units connected through a flexible cable to the power supply. They can be easily positioned where needed in the waveguide system.

Klystron Burnout Protection:

A thermostat located in the water cooling jackets of the klystron automatically turns off the MO-4 if the klystron overheats.

AFF Capability:

Automatic frequency following capability is provided in the MO-4 Power Supply when it is used in a system which includes the Weinschel Engineering Model VM-1 Standard Attenuator Comparator.

USES:

This Ultra Stable Signal Source System is designed to provide sources with low FM, stable power. The system is a recommended accessory for making precision attenuation measurements with the Weinschel Model VM-1 Standard Attenuator Comparator in XB, X and KU bands. It is also recommended for use in other precision measuring systems where amplitude stability and low incidental FM, especially when 100% square wave modulated, are of primary importance.

DESCRIPTION:

The components listed above may be supplied separately or in several combinations as a complete system. The MS-30, MS-31 and MS-32 are separate RF Sources, each comprised of an internal cavity klystron and a 20 db directional coupler with a cavity type, direct reading wavemeter and crystal detector attached to the sidearm. The klystron and water cooling jackets are enclosed in a shield box with rf filters on all input leads. A thermostat in the cooling jackets automatically turns off the MO-4 Power Supply should the klystron overheat. These sources are furnished with all necessary cables, connectors and hoses to make the connections to the MO-4 and KC-1.

The Model MO-4 is a highly regulated power supply designed to power either the MS-30, MS-31 or MS-32 RF Source. For applications where more than one RF Source are to be used simultaneously, one MO-4 is required for each source.

The Klystron Cooling Control, Model KC-1, is a self-contained, gravity flow type water cooling system. The system does not require access to an external source of water, but rather utilizes a float actuated pump to return the water from a lower reservoir to an upper reservoir. One Model KC-1 has capacity sufficient to provide cooling for two klystrons at the same time. The reservoir and control unit are supplied in a six foot closed relay rack that has sufficient extra panel space available for mounting one or two MO-4 Power Supplies.

KLYSTRON POWER SUPPLY, MODEL MO-4:

SPECIFICATIONS:

Modulation Capability:

Repeller Modulation - 100% square wave repeller modulation can be obtained when an external 80 volt peak-to-peak square wave is applied to the MO-4. The modulation signal may be clamped on either the positive or negative polarity.

External Ferrite Modulation - When an external square wave of 35 volts peak-to-peak is applied, the MO-4 will provide square wave driving current to a suitable external ferrite modulator. The current is adjustable between 0.5 and 100 milliamperes and is monitored on a front panel meter.

	Voltage	Stability	Regulation	Current	Ripple & Noise
Beam Supply	Variable between -400V dc and -550V dc. Monitored on front panel meter	Short time: ± 0.01% Long time: ± 0.1%	For ± 10% line voltage variation: ± 0.01%	65 milliamps maximum. Monitored on front panel meter	Less than 500 microvolts rms
Repeller Supply	Variable by means of coarse and fine front panel controls from -45V dc to -650V dc. Monitored on front panel meter	Short time: ± 0.01% Long time: ± 0.1%	For ± 10% line voltage variation: ± 0.01%		Less than 1.0 millivolt rms
Klystron Heater Supply	6.3V dc ± 5% (over load range). Monitored on front panel meter		For ± 10% line voltage variation: ± 1%	0.5 Amp maximum	Less than 10 millivolts rms

Automatic Frequency Follower:

Provision is made for AFF action when used with the Weinschel VM-1 Standard Attenuator Comparator.

Indicators:

Two meters are mounted on the front panel. One monitors repeller voltage while the other, by means of a selector switch, indicates beam voltage, beam current, external ferrite modulator driving current, filament voltage, or it may be used to monitor the output of a cavity type wavemeter and crystal detector combination when setting the frequency of the klystron. Both a "high" and a "low" sensitivity switch position are available for monitoring the crystal detector output.

Primary Power:

115/220V ac, ± 10%; 50/60 cps; 320 VA at 115V ac.

DIMENSIONS:

10-1/2" x 19" - designed to fit standard relay rack.
16" maximum depth behind panel.

MODEL MS-30, MODEL MS-31, MODEL MS-32:

The illustration shows the klystron cooling jacket and waveguide attachments. The metallic box-like container in the center of the picture holds the preset thermostat which automatically shuts off the MO-4 Power Supply if the klystron overheats.

SPECIFICATIONS

Model Number	MS-30	MS-31	MS-32
FREQUENCY			
Range	7.5 - 10.0 GC	8.2 - 12.4 GC	12.4 - 18.0 GC
Indicator Accuracy	Accuracy of direct reading wavemeter is ± 0.1%	Accuracy of direct reading wavemeter is ± 0.1%	Accuracy of direct reading wavemeter is 0.1%
Incidental FM*	When operated cw or when 100% square wave modulated the incidental FM is less than 20 KC	When operated cw or when 100% square wave modulated the incidental FM is less than 20 KC	When operated cw or when 100% square wave modulated the incidental FM is less than 20 KC
POWER OUTPUT			
CW (Minimum)	50 milliwatts into matched load	50 milliwatts into matched load	25 milliwatts into matched load
100% Square Wave Modulated Peak Power	50 milliwatts into matched load	50 milliwatts into matched load	25 milliwatts into matched load
EQUIPMENT SUPPLIED			
Klystron	Varian X-13B tunable internal cavity klystron	Varian X-13 tunable internal cavity klystron	Varian X-12 tunable internal cavity klystron
Shield Box	Includes RF filters on all leads	Includes RF filters on all leads	Includes RF filters on all leads
Water Jackets	Includes thermostat preset to 120°F and interlocked with power supply for klystron protection	Includes thermostat preset to 120°F and interlocked with power supply for klystron protection	Includes thermostat preset to 120°F and interlocked with power supply for klystron protection
Adapter	RG-51/U to RG-52/U		
Directional Coupler	20 db multihole coupler	20 db multihole coupler	20 db multihole coupler
Wavemeter	Direct reading cavity type	Direct reading cavity type	Direct reading cavity type
Crystal Detector	RG-51/U Waveguide input	RG-52/U Waveguide	RG-91/U Waveguide
Cables and Connectors	All cables, connectors and hoses necessary for making connections to power supply and cooling unit	All cables, connectors and hoses necessary for making connections to power supply and cooling unit	All cables, connectors and hoses necessary for making connections to power supply and cooling unit

*Specifications listed hold true only when used with recommended accessories.

SPECIFICATIONS (Cont.)

Model Number	MS-30	MS-31	MS-32
DIMENSIONS			
Shield Box	Approximately 7" x 8" x 7"	Approximately 7" x 8" x 7"	Approximately 7" x 8" x 7"
Waveguide Size	RG-51/U	RG-52/U	RG-91/U
Output Flanges	UG-51/U	UG-39/U	UG-419/U

KLYSTRON COOLING CONTROL, MODEL KC-1:

SPECIFICATIONS:

Water Capacity:

Approximately 4 gallons.

Flow:

Gravity flow with float actuated recirculating pump.

Outputs:

Two water outlets with individual shut-offs will cool either one or two klystrons.

Power Requirements:

115V ac, 60 cps.

Dimensions:

Supplied in standard 6' closed relay rack. Panel opening is 19" wide. Upper unit panel is 8-3/4" high. Lower unit panel is 19-1/4" high.

	MO-4	MS-30	MS-31	MS-32	KC-1
Price	$2,000.00	$2,320.00	$1,790.00		$1,400.00

Terms:

All prices and specifications are subject to change without notice. Terms are net 30 days, subject to approval of credit. All prices are F.O.B. Gaithersburg, Maryland, and include packing for domestic shipment within the continental United States.

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